



Weather-induced temporal variations in nitrate concentrations in shallow groundwater

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Abstract:

For the evaluation of policy action programs to improve groundwater quality, research institutes and governments intensively monitor nitrate concentrations in shallow or near surface groundwater. However, trend detection is often hampered by the large seasonal and multi-annual temporal variability in nitrate concentrations, especially in shallow groundwater within 0-5 m below the surface in relatively humid regions. This variability is mainly caused by variations in precipitation excess (precipitation minus evapotranspiration) that results in strong variability in groundwater recharge. The objective of this study was to understand and quantify this weather-induced variability in shallow groundwater nitrate concentrations. We present an example of measured weather related variations in shallow groundwater nitrate concentrations from De Marke, an intensively monitored experimental farm in The Netherlands. For the quantification of the weather-induced variability, concentration-indices were calculated using a 1D model for water and solute transport. The results indicate that nitrate concentrations in the upper meter of groundwater at De Marke vary between 55% and 153% of the average concentration due to meteorological variability. The concentration-index quantification method was successfully used to distinguish weather related variability from human-induced trends in the nitrate concentration monitoring data from De Marke. Our model simulations also shows that sampling from fixed monitoring wells produces less short term variability than measuring from open boreholes. In addition, using larger screen depths and longer screens filters out short term temporal variability at the cost of a more delayed detection of trends in groundwater quality. © 2009 Elsevier B.V. All rights reserved.

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Resource Description

Communication:

resource focus on research or methods on how to communicate or frame issues on climate change; surveys of attitudes, knowledge, beliefs about climate change

A focus of content

Communication Audience:

audience to whom the resource is directed

Policymaker



Climate Change and Human Health Literature Portal

Exposure :

weather or climate related pathway by which climate change affects health

Food/Water Quality, Precipitation

Food/Water Quality: Chemical, Other Water Quality Issue

Water Quality (other): Nitrate

Geographic Feature:

resource focuses on specific type of geography

Freshwater

Geographic Location:

resource focuses on specific location

Non-United States

Non-United States: Europe

European Region/Country: European Country

Other European Country : The Netherlands

Health Impact:

specification of health effect or disease related to climate change exposure

Health Outcome Unspecified

Mitigation/Adaptation:

mitigation or adaptation strategy is a focus of resource

Adaptation

Resource Type:

format or standard characteristic of resource

Research Article

Timescale:

time period studied

Time Scale Unspecified

Vulnerability/Impact Assessment:

resource focus on process of identifying, quantifying, and prioritizing vulnerabilities in a system

A focus of content